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PENSOFT

Pseudephemerum nitidum (Hedw.) Loeske (Bryophyta) rediscovered in Brazil

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Abstract
The sole record of the genus *Pseudephemerum* recorded from Brazil consists of the type specimen of *Ephemerella caldensis* Müll.Hal., which is currently a synonym of *P. nitidum* (Hedw.) Loeske. While conducting a revision of the Ditrichaceae from Brazil, several specimens of *Pleuridium* were evaluated that proved to be this species, and thus, after 154 years, we rediscovered *Pseudephemerum nitidum* in Brazil. In the most recent checklists of Brazilian mosses, this species was excluded for lack of knowledge. This is the second record in Brazil and the third in South America.

Key words
Dicranales; Ditrichaceae; moss; cleistocarpic moss; bryophytes; rheophilic plants.

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Introduction

Within Brazil the record of the genus *Pseudephemerum* (Lindb.) I.Hagen and its only species, *P. nitidum* (Hedw.) Loeske, has been controversial. The synoptic checklist of Costa et al. (2011) did not include this species.

The occurrence of this species remained confined to the type specimen of *Ephemerella caldensis* Müll.Hal., which was cited in Yano (2011) as *Pseudephemerum caldense* (Müll.Hal.) Broth. and cross-referenced to the type specimen originally described by Müller (1859). The name *P. caldense* was synonymized with *P. nitidum* by Yip (1998) in his world revision of the genus. This author recognized the genus as monotypic with only 1 taxon, *P. nitidum*. This species was not cited in the Flora do Brasil Online (FBO 2017) and remains largely unknown in Brazil.

Pseudephemerum belongs to Bryopsida, the largest class of mosses, in the order Dicranales and family Ditrichaceae (Stech and Frey 2008). The morphology in this order is difficult to delimit, and sterile specimens can often be confused with juvenile material of species of Archidiaceae, Dicranaceae, Ditrichaceae, Ephemeraceae, and Pottiaceae. Capsules of cleistocarpic mosses or sporophytes with short setae do not provide the characters needed to identify families because the classifications are all based on peristomial morphology.

Characters exclusive to *Pseudephemerum* are leaf apex denticulate, lax laminal cells, and several sporophytes born along the stem in the leaf axils, not only apically. Yip (1998) pointed out the persistence of vaginula near the base of the branches, and Arts (1990) described the rhizoidal tubers, as a useful character, to distinguish sterile specimens.

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Pseudephemerum nitidum was morphologically described in full by Yip (1998), who reported for it a wide geographical distribution, and several records can be found in the GBIF database (2017) and Hodgetts (2015). *Pseudephemerum nitidum* is widely distributed in Europe (Czech Republic, Denmark, Finland, France, Jersey, Guernsey [2 Crown dependencies of the Channel Islands], Germany, Ireland, Italy, Luxembourg, Portugal, Norway, Spain, Sweden, and the United Kingdom), Asia (Assam [northeastern India], Nepal, Sri Lanka, and Japan), Africa (Congo, Madagascar, Rwanda, Uganda, and Zaire), Australia (Tasmania), New Zealand), and North America (Canada, Mexico and the USA).

In Europe, this species was evaluated as a Least Concern species by Hodgetts (2015) based on its wide distribution growing on the edge of fields (Belland 1998). However, despite its wide range, Schofield (1976) and Smith (2004) emphasized the need for more studies because its life history is virtually unknown, and the protonematal, germination and development of the spore evoke a typical pattern, even though sporophytes are unremarkable and are produced all year long, as described for England (Smith 2004).

The geographical range of this species outside Europe is rare with sparse occurrences (GBIF 2017). In South America, it has only been recorded for Colombia and Brazil.

Methods

During the revision of the Ditrichaceae species to Brazil, we evaluated several related genera, and 1 specimen determined to be *Pleuridium* turned out to be *Pseudephemerum nitidum*.

The identification of the specimen was based on the works of illustrations and description in Roth (1911), De Sloover (1976) and Iwatsuki (1980).

We include approximate coordinates for the type specimens of *P. caldensis* in the municipality of Caldas, Minas Gerais State (21°92' S, 046°38' W).

Therefore, based on this interesting rediscovery in Brazil after 154 years since the description of the *Ephemerella caldense* by Müller (1859), we provide herein a description, illustration, and conservation comments for this *P. nitidum* with the aim of stimulating new collections and determinations of herbaria specimens.

Results

Materials examined. The specimen examined is a herbarium collection, gathered in Brazil, state of Paraná, municipality of Quitandinha, on 23 Jul 1980, 25°53′ S, 049°30′ W, 850 m alt., the collector was *Daniel M. Vital 9500*, this material is housed at the SP herbarium with the registration number 149344. One additional specimen of the species was examined from the Czech Republic at Bohemia, collected Nov 1885, *Schmidt s.n.* [hb Rosenstock no.18], this material is housed in the R herbaria with the registration number 80345.

Pseudephemerum nitidum (Hedw.) Loeske

Figures 1–19

Pseudephemerum nitidum (Hedw.) Loeske, Stud. Morph. Laubm. 75. 1910. *non* Reimers 1933, *hom. illeg.* (see Ochyra 1995) ≡ *Ephemerum nitidum* (Hedw.) Hampe, Flora 20: 285. 1837 ≡ *Pleuridium nitidum* (Hedw.) Rabenh., Deutschl. Krypt.-Fl. 2 (3): 79. 1848 ≡ *Phascum nitidum* Hedw., Sp. Musc. Frond. 19. 1801. Type: Germany "*Lipsiae in silva Lindenthaliensi, et Chemnizii Saxoum*" (G hb. Hedw.), *non. vid.*

= *Ephemerella caldensis* Müll.Hal., Bot. Zeitung (Berlin) 17: 197. 1859 ≡ *Astomum caldense* (Müll.Hal.) Lindb. *ex* Müll.Hal., Bot. Zeitung (Berlin) 17: 197. 1859, *nom. inval.* ≡ *Phascum caldense* (Müll. Hal.) Lindb., Öfvers. Förh. Kongl. Svenska Vetensk.-Akad. 20: 408. 1863 ≡ *Pleuridium caldense* (Müll.Hal.) Lindb., Öfvers. Förh. Kongl. Svenska Vetensk.-Akad. 21: 584. 1865 ≡ *Pseudephemerum caldense* (Müll.Hal.) Broth., Nat. Pflanzenfam. (ed. 2) 10: 177. 1924. Type: Brazil, Minas Gerais, prope oppidum Caldas in palude Ribeirão dos Bugres, 25.VII.1854, *Lindberg s.n.* (Isotype: L, RO), synonymy by Iwatsuki (1980) and Yip (2002).

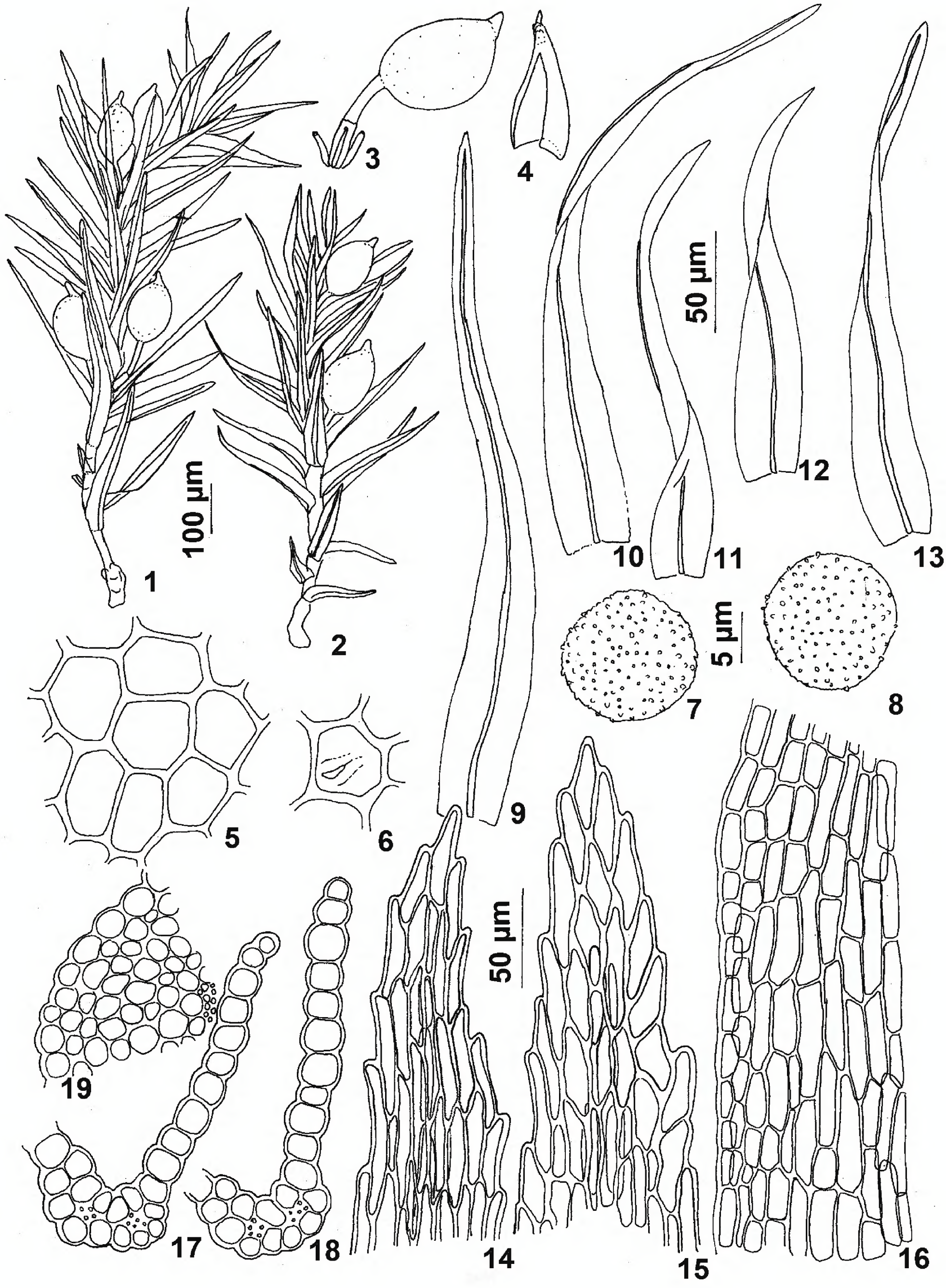
Plants small, 0.4–1.0(–2) mm long, stems flexuose, brown, with few innovations; rhizoids short, reddish to brown. Stem cross section with central strands; leaves 0.2–0.4 mm long, becoming larger in coma, erect, linear-lanceolate to ovate-lanceolate at base; apex acuminate, denticulate, ending in three rhomboidal cells; basal and median margin entire, median cells linear-rectangular to fusiform, lax-walled, basal cells long-rectangular; costa subpercurrent. Leaf cross section with central stereids and lax epidermal cells without guide cells. Perichaetial leaves not differentiated. Sporophytes with short setae; cleistocarpic capsule 0.2–0.25 mm long, with large apiculus, mitrate calyptrae. Spores large, sharply ornamented.

Discussion

Pseudephemerum nitidum has a worldwide distribution, but it has been recorded for Brazil in only 2 places, Minas Gerais (type specimen *Ephemerella caldensis*) and Paraná (the record herein reported), both in the Atlantic Forest Domain (Fig. 20).

The plants without sporophytes can be confused with *Archidium ohioense* Schimp. *ex* Müll.Hal., but no *Archidium* species has a central strand in the leaf or stem cross section like that of *Micromitrium tenerum* (Bruch & Schimp.) Crosby, but this species has no costa or vestigial calyptra.

A current conservation evaluation pointed to this species as threatened, but this is likely based on minimal sampling since this is a small plant with a rheophilic habitat along river banks that are temporarily sandy, but kept humid by constant percolation. Therefore, we believe that our description and illustration will encourage a renewed focus on small plants and that collectors will be encouraged to find new populations.



Figures 1–19. *Pseudephemerum nitidum* (Hedw.) Loeske. **1, 2.** Gametophytes with sporophytes. **3.** Capsule. **4.** Calyptra. **5.** Exothecial cells of capsule. **6.** Stomata at capsule base. **7, 8.** Spores. **9–13.** Leaves. **14, 15.** apical cells of the leaf. **16.** Basal cells of the leaf. **17, 18.** Leaf cross section. **19.** Stem cross section.

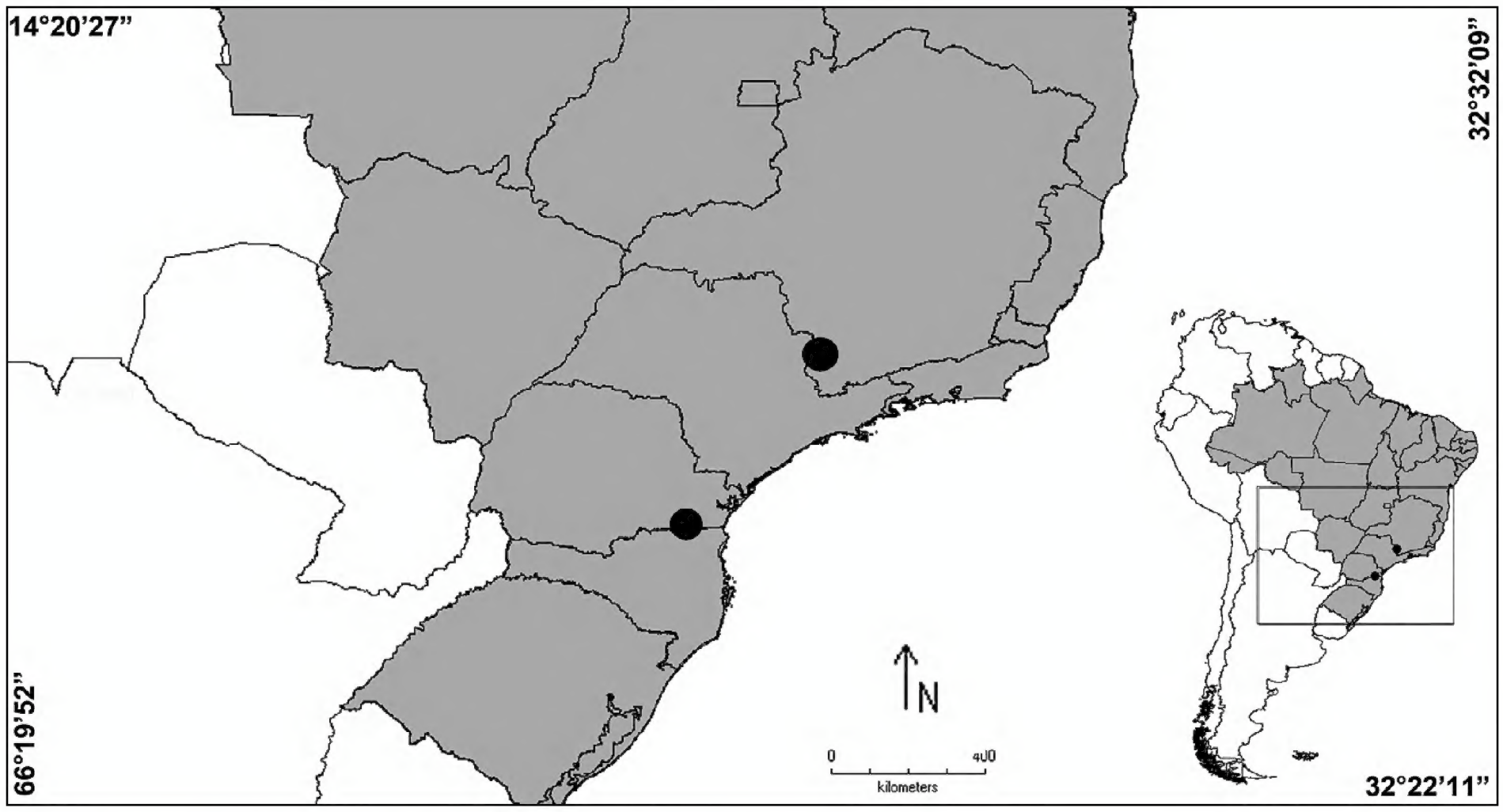


Figure 20. Occurrence map of the distribution of *Pseudephemerum nitidum* in Brazil.

Authors' Contributions

Both authors collected the data, identified the species, and wrote the text.

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